

Claims

1. A method for providing a process model
for a material in a manufacturing process, including
5 the steps of:

receiving stress and distortion information
of the material from a previous manufacturing process;

determining updated stress and distortion
information of the material from a process model for
10 the present manufacturing process, the updated stress
and distortion information being a function of the
stresses and distortions caused by the present
manufacturing process and the stresses and distortions
from the previous manufacturing process; and

15 providing the updated stress and distortion
information of the material to a subsequent
manufacturing process.

2. A method, as set forth in claim 1,
20 wherein the process model is a thermal process model.

3. A method, as set forth in claim 2,
wherein the stresses and distortions are thermal
stresses and distortions.

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4. A method, as set forth in claim 3,
wherein the stresses and distortions include changes
in dimensions of the material.

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5. A method, as set forth in claim 3, wherein the stresses and distortions include changes in properties of the material.

5 6. A method, as set forth in claim 3, wherein the material is a metal being processed by thermal processes.

7. A method, as set forth in claim 6,
10 wherein the thermal process is one of a thermal cutting and welding process.

8. A method for providing a process model for a material in a thermal cutting process, including
15 the steps of:

receiving stress and distortion information of the material from a previous manufacturing process;

determining updated stress and distortion information of the material from a process model for
20 the thermal cutting process, the updated stress and distortion information being a function of the stresses and distortions caused by the thermal cutting process and the stresses and distortions from the previous manufacturing process; and

25 providing the updated stress and distortion information of the material to a subsequent manufacturing process.

9. A method, as set forth in claim 8, wherein the material is a metal being cut by the thermal cutting process.

5 10. A method, as set forth in claim 9, wherein the previous manufacturing process is one of a steel rolling process and a shot blasting process.

10 11. A method, as set forth in claim 9, wherein the subsequent manufacturing process is one of a bending process and a welding process.

15 12. A method, as set forth in claim 8, wherein determining the updated stress and distortion information includes the steps of:

receiving residual stress information from the previous manufacturing process;

mapping deformations of the material from the stress and distortion information received from
20 the previous manufacturing process;

modeling the thermal stresses caused by thermal cutting of the material;

incorporating a set of thermal material laws of the material, the thermal material laws defining
25 properties of the material in a transition state from solid to liquid; and

determining a thermal cutting model of the stresses and distortions of the material as a function of the above steps.

13. A method for providing a process model for a material in a welding process, including the steps of:

receiving stress and distortion information
5 of the material from a previous manufacturing process;

determining updated stress and distortion
information of the material from a process model for
the welding process, the updated stress and distortion
information being a function of the stresses and
10 distortions caused by the welding process and the
stresses and distortions from the previous
manufacturing process; and

providing the updated stress and distortion
information of the material to a subsequent
15 manufacturing process.

14. A method, as set forth in claim 13,
wherein the material is a metal being welded by the
welding process.

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15. A method, as set forth in claim 14,
wherein the previous manufacturing process is one of a
thermal cutting process and a bending process.

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16. A method, as set forth in claim 14,
wherein the subsequent manufacturing process is a
machining process.